February 25, 2004

Teachers' Retirement Board
CalSTRS

Re: 2003 Actuarial Experience Analysis

Dear Members of the Board:

The actuarial valuations as of June 30, 2003, will become the cornerstone for analyzing the funding status of the System's Defined Benefit (DB) Program, Defined Benefit Supplement (DBS) Program, and the Cash Balance Benefit (CBB) Program. Additional actuarial information will be developed for disclosing employer liabilities on financial statements, and for analyzing the fiscal impact of proposed future legislation.

The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the upcoming valuations. A few of our recommendations represent changes from the prior methods or assumptions, and are designed to better anticipate the emerging experience of each Program.

In preparing this report, we relied without audit on information supplied by the System's staff. In our examination, we have found the data to be reasonably consistent and comparable with data used for other purposes. It should be noted that if any data or other information is inaccurate or incomplete, our calculations might need to be revised.

Any distribution of this report must be in its entirety, including this cover letter, unless prior written consent is obtained from Milliman.

We look forward to our discussions and the opportunity to respond to your questions and comments at your next meeting.

Respectfully submitted,

Mark O. Johnson, F.S.A.
Consulting Actuary

Section 1
Purpose and Scope of the Study

Purpose of the Study

The primary purpose of an actuarial valuation is to analyze the sufficiency of future contributions from members, employers and the State, to meet the current and future obligations of each program. By using the actuarial methods and assumptions adopted by the Retirement Board, the actuarial valuations will provide the best estimate of the long-term financing of the programs.

The purpose of this study is to recommend a set of actuarial methods and assumptions for the 2003 actuarial valuations. We expect these methods and assumptions to be used until the next Experience Analysis is completed. These methods and assumptions have been developed in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the applicable Standards of Practice adopted by the Actuarial Standards Board of the American Academy of Actuaries.

Scope of the Study

Actuarial valuations utilize various methods and procedures and two different types of assumptions. Economic assumptions are related to the general economy and its impact on CalSTRS, while demographic assumptions are based on the emergence of the specific experience of CalSTRS members.

All of the methods and assumptions that will be used in the 2003 and later actuarial valuations have been reviewed in this Study. The remainder of this report is organized in the following manner:

- Section 2   Summary of Recommendations
- Section 3   Actuarial Methods
- Section 4   Economic Assumptions
- Section 5   Demographic Assumptions

Section 2
Summary of Key Recommendations

Actuarial Methods

The key methods are the actuarial cost method and the asset smoothing method. We reviewed these methods and concluded they are still appropriate. We are not making any recommendations for changes at this time.

- The funded status of the DB Program is measured by the Entry Age Actuarial Cost Method. The funded status is measured by the Traditional Unit Credit Cost Method for both the DBS and CBB Programs.

- The DB Program is valued using an asset smoothing method. The Method is the Cumulative Expected Value Method with One-Third Recognition of Gains and Losses. The DBS and CBB Programs use Fair Value of Assets.

Economic Assumptions

The two major economic assumptions are net investment return and wage growth and each is affected by the underlying assumed rate of inflation. Based on past experience and future expectations, we are recommending several changes, which taken together, will not impact the valuations.

- We are recommending a reduction in the assumed future rate of inflation from 3.50% to 3.25%. This is a building block for the other assumptions.

- We are recommending an increase in the assumed real rate of investment return, but the total net investment return assumption will stay the same.

- We are recommending an increase in the real wage growth, but again the total wage growth assumption will stay the same.

Our recommendations are as follows.

	Current	Recommended
Inflation	3.50%	3.25%
Net Real Rate of Return	4.50	4.75
Investment Return	8.00%	8.00%
Inflation	3.50%	3.25%
Real Wage Growth	0.75	1.00
Wage Growth	4.25%	4.25%

Demographic Assumptions

The following list shows the demographic assumptions we reviewed, all of which are based on the experience of the membership. We are making recommendations for changing only a few of the assumptions.

All Assumptions Based on Experience of the DB Program	Recommended Revisions
Mortality	
Healthy Retired Members	no
Beneficiaries	no
Active Members	no
Pre-1972 Disabled Members	yes
Disabled Members	no
Service Retirement	
Retirement from Active Membership	yes
Retirement from Vested Membership	no
Disability	
Coverage A	no
Coverage B	yes
Other Terminations of Membership	
Withdrawal	yes
Probability of Refund	yes
Merit Scale Salary Adjustments	no

The most significant revision is the change to the expected service retirement rates. We found a dramatic difference in the rates of retirement depending on whether or not the member had 30 years of service. This was a trend we were looking for due to the passage of the benefit enhancements since the last experience analysis.

Based on a modeling technique, we expect the recommended revisions to produce a slight increase in the funding requirements of the DB Program.

Section 3
Actuarial Methods

This section describes the actuarial cost method and the asset valuation method that are used to process the data, and predict the funding requirements of each Program.

Actuarial Cost Methods	
DB Program	Entry Age
DBS Program	Traditional Unit Credit
CBB Program	Traditional Unit Credit
Asset Valuation Methods	
DB Program	Cumulative Expected Value with One-Third Recognition of Gains and Losses
DBS Program	Fair Market Value
CBB Program	Fair Market Value

We are not recommending any changes to the methods that are currently in place. The following sections provide a brief explanation of each of the methods.

Actuarial Cost Methods

DB Program: The accruing costs of all benefits are measured by the Entry Age Actuarial Cost Method. The actuarial present value of projected benefits for each individual member included in the valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this actuarial present value allocated to a valuation year is called the Normal Cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future Normal Costs is called the Actuarial Obligation. The excess of the Actuarial Obligation over the Actuarial Value of Assets is called the Unfunded Actuarial Obligation. If the Actuarial Value of Assets exceeds the Actuarial Obligation, the difference is called the Actuarial Surplus.

The ages at entry of future active members are assumed to average the same as the entry ages of the present active members they replace. If the number of active members should increase (or decrease), it is further assumed that the average entry age of the larger (or smaller) group will be the same, from an actuarial standpoint, as that of the present active group. Under these assumptions, the Normal Cost Rate will not vary with the termination of the present active membership, or with an expansion or contraction of the active membership.

DBS and CBB Programs: The Traditional Unit Credit Actuarial Cost Method is used to analyze the funding status of these programs. Under this method, the projected benefits of each individual member are allocated by a consistent formula to valuation years. The actuarial present value of future projected benefits allocated to the current year is called the Normal Cost. The actuarial present value of future projected benefits allocated to periods prior to the valuation year is called the Actuarial Obligation.

The Actuarial Obligation is equal to the accumulated account balances and the Normal Cost is equal to the total annual contribution.

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Asset Valuation Methods

The audited financial statements are created as of June 30 each year. We receive a special report providing the information for each of the three programs. The financial statements reflect the fair value of assets, sometimes referred to as the market value, or fair market value.

DB Program: The valuation of assets for an actuarial valuation of a defined benefit pension plan may be thought of in a different light than the value of assets for a retirement system's financial statement. The purpose in a financial statement disclosure is to make a representation of the current value of the assets on a fair value basis. Because the underlying calculations in the actuarial valuation are long-term in nature, and one of the goals of the actuarial valuation process is to measure the funding stability of the DB Program, it can be advantageous to smooth out short-term fluctuations in the fair value of assets.

Like the majority of large public retirement systems, the DB Program uses an asset smoothing method to determine the Actuarial Value of Assets.

The assets are valued using a method that delays recognition of investment gains or losses. The expected actuarial value is the prior year's actuarial value increased with net cash flow of funds, and all increased with interest during the past year at the expected investment return assumption. One-third of the difference between the expected actuarial value of assets and the Fair Market Value of assets is added to the expected actuarial value of assets to arrive at the Actuarial Value of Assets.

The following table includes the derivation of the Actuarial Value of Assets as of June 30, 2003.

($Millions)		June, 2002	June, 2003
Actuarial Value at Beginning of Year		$ 108,571	$ 109,755
Contributions		4,019	4,465
Benefits and Expenses		(4,633)	(5,084)
Expected Return at 8%		8,661	8,755
Expected Actuarial Value End of Year	**(A)**	$ 116,618	$ 117,891
Fair Market Value		96,028	99,031
Difference between Fair Market Value and Expected Actuarial Value		$ (20,590)	$ (18,860)
Recognition Factor		One-third	One-third
Recognized Gain or Loss	**(B)**	$ (6,863)	$ (6,287)
Actuarial Value at End of Year (Expected Value plus Recognized Gain or Loss)	**(A) + (B)**	$ 109,755	$ 111,604
Ratio of Actuarial Value of Assets to Fair Market Value of Assets		*114%*	*113%*
Estimated Net Rate of Return		(6.1)%	3.8%

The following chart shows a history of the Actuarial Value of Assets compared to the Fair Market Value of Assets. You can see that, after relatively poor investment years, the Actuarial Value of Assets exceeds the Fair Market Value because all of the recent losses are not recognized.

($Millions) June 30	Fair Market Value of Assets	Estimated Annual Return	Actuarial Value of Assets	Ratio of Actuarial to Market
1994	$ 47,631	0.3%	$ 50,203	105%
1995	55,862	16.9	55,047	99
1996	63,455	13.3	60,876	96
1997	74,778	17.3	68,966	92
1998	88,198	17.3	79,381	90
1999	99,780	13.4	90,265	90
2000	112,771	12.7	102,790	91
2001	102,915	(9.1)	108,571	105
2002	96,028	(6.1)	109,755	114
2003	99,031	3.8	111,604	113
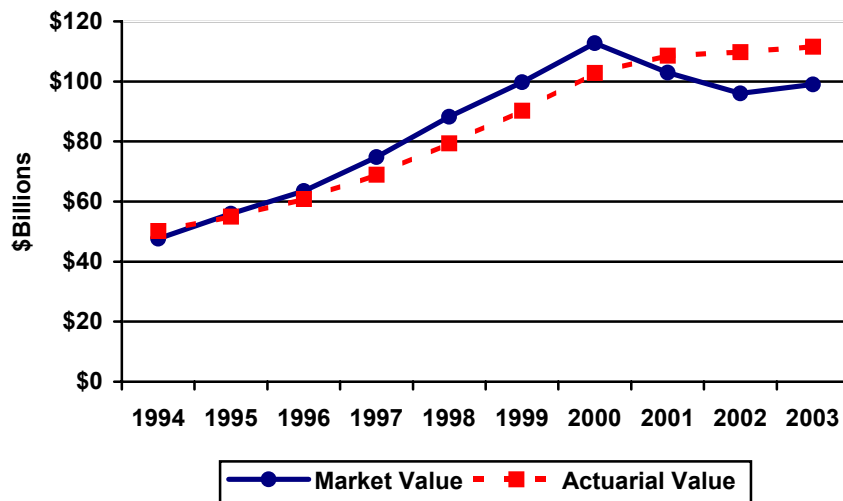
This current asset smoothing method was adopted for the 1999 actuarial valuation and is effective for the investment experience beginning in July of 1993. Prior to the 1999 actuarial valuation, the recognition factor was one-fourth instead of one-third. We recommend the current method be continued.

DBS and CBB Programs: The assets are valued at Fair Market Value. We recommend this method be continued in the valuations for a direct comparison with the accumulated account balances on the valuation date.

Section 4
Economic Assumptions

Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans. Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Recognizing that there is not one "right answer", the standard calls for the actuary to develop a best estimate range for each economic assumption, and then recommend a specific point within that range. Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table shows our recommendations.

	DB Program		DBS and CBB Programs	
	Current	**Recommended**	**Current**	**Recommended**
Consumer Price Inflation	3.50%	3.25%	3.50%	3.25%
Net Real Rate of Return	4.50	4.75	4.50	4.75
Investment Return	8.00%	8.00%	8.00%	8.00%
Interest on Member Accounts	6.00%	6.00%	8.00%	8.00%
Consumer Price Inflation	3.50%	3.25%	3.50%	3.25%
Net Real Rate of Return	0.75	1.00	0.75	1.00
Wage Growth	4.25%	4.25%	4.25%	4.25%

Although we recommend a change in the assumed inflation rate, our recommendations will result in all of the economic assumptions remaining the same.

Consumer Price Inflation

Use in the Valuation: Future price inflation has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment returns and wage growth. It will also have an impact on the predicted sustainability of the Supplemental Benefit Maintenance Account (SBMA).

The current assumption for inflation is 3.50% per year.

Historical Perspective: We have used certain published economic statistics that have been accumulated on a monthly basis over the last 75 years. The data for inflation is based on the Consumer Price Index, US City Average, All Urban Consumers (CPI). The data for periods ending in June of each year is documented in Exhibit 1.

There are numerous ways to review this data. The tables below show the compounded annual inflation rate for various ten-year periods and for longer periods ended in June of 2003.

Period	CPI	CCPI
1993-2003	2.44%	2.46%
1983-1993	3.79	4.16
1973-1983	8.45	8.78
1963-1973	3.75	3.52
1953-1963	1.33	

Period	CPI	CCPI
1993-2003	2.44%	2.46%
1983-2003	3.11	3.31
1973-2003	4.86	5.10
1963-2003	4.58	4.70
1953-2003	3.92	
75 Years	3.22%	

History of National CPI-U
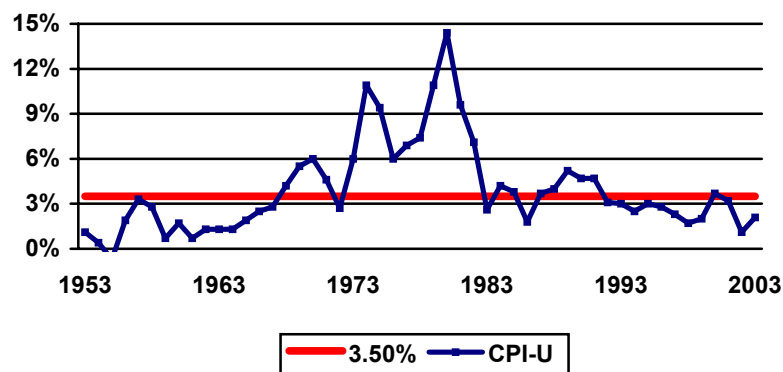
It is interesting, but not critical in the global sense of the economy, to look at inflation rates in the State of California (CCPI). There have been variances from the national CPI over short periods, however, the average increases over longer periods of time, particularly the last 10 years, are very close. The CCPI history is included in Exhibit 2.

Many economists forecast inflation lower than the current assumption of 3.50%, but may be looking at shorter periods than appropriate for a pension valuation. To find an economic forecast with a long enough time frame to suit our purpose, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2003 Trustees Report, the projected average annual increase in the CPI over the next 30 years under the intermediate cost assumptions was 3.00%. The reasonable range was stated as 2.00% to 4.00%.

We agree with the Social Security projections that a range between 2.00% and 4.00% is reasonable for an actuarial valuation of a retirement system. We recommend a long-term assumed inflation rate of 3.25% per year, which will be used to build the net investment return and wage growth assumptions. We do not believe the difference between the national CPI and the California CPI will be statistically significant for predicting future wage growth for California's teachers.

Reasonable Range and Recommendation: We believe that the current assumption of 3.50% per year is toward the high end of the reasonable range for the long-term future. Based on the history over the last 75 years, and future expectations, we recommend that the long-term assumed inflation rate be lowered from 3.50% to 3.25%.

Consumer Price Inflation	
Current Assumption	3.50%
Reasonable Range	2.00% - 4.00%
Recommended Assumption	3.25%

Investment Return

Use in the Valuation: The investment return assumption is one of the primary determinants in the calculation of the expected cost of the System's benefits, providing a discount of the future benefit payments reflecting the time value of money. Due to different asset allocation policies, the assumption is studied separately for the DBS and CBB Programs.

The current investment return assumption for all programs is 8.00% per year, net of all administrative and investment-related expenses.

Historical Perspective: One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the time frame used if the year-to-year results tend to vary widely. For example, the unusually low equity returns over the last several years have had a remarkable impact on rolling ten-year period returns when compared to just a few years ago. Furthermore, the approach we used to predict inflation does not necessarily reflect current expectations for the capital markets. Even though history provides a valuable perspective for setting this assumption, the economy of the past is not today's economy.

Projection Model using Capital Market Assumptions: In our opinion, a better approach builds upon the latest capital market assumptions adopted by the Retirement Board. We have documented these assumptions in Exhibit 3. A formula-based model was used to predict future returns based on these capital market assumptions, the asset allocation policy, and assumed annual rebalancing. The asset allocation and the expected real returns and total returns by asset class are shown below.

Asset Class for the DB Program	Allocation for DB Program	Real Rate of Return	Standard Deviation
US Equities	38%	6.75%	22.0%
International Equities	20	6.75	22.0
Core Fixed Income	26	3.25	8.0
Private Equity	8	10.00	35.0
Real Estate	7	5.00	13.5
Cash Equivalents	1	2.00	1.5
Total Portfolio	100%	5.93%	15.0%

The capital market assumptions were combined with the Board's asset allocation policy to generate expected returns. The expected real rate of return of a portfolio allocated according to current policy is 5.93% for one year, 9.18% including an assumed inflation rate of 3.25%. However, the return is subject to significant year-to-year volatility as evidenced by the standard deviation. Volatility over time will lower the mean rate of return, but diversification by asset class narrows the range of expected returns. The model provides a guide to see if it is reasonable to expect this return to compound over longer periods of time. The results are summarized below, showing expected real rates of return up to 30 years.

Horizon in Years	Mean	Std Dev	Percentile Results for Real Rate of Return – DB Program				
			5th	25th	50th	75th	95th
1	5.9%	15.0%	-16.8%	-4.6%	4.9%	15.3%	32.2%
5	5.1	6.6	-5.4	0.5	4.9	9.4	16.3
10	5.0	4.7	-2.5	1.8	4.9	8.1	12.9
20	4.9	3.3	-0.4	2.7	4.9	7.1	10.5
30	4.9	2.7	0.5	**3.1**	**4.9**	**6.7**	9.4

In the first year, the mean real return is 5.93%, but due to the volatility associated with the asset allocation, the range of probable outcomes is quite large. For example, in the first year there is a 5% chance the real rate of return will be less than –16.8% and a 5% chance it will be greater than 32.2%. As the time horizon lengthens, the range of cumulative average results narrows.

Over a thirty-year time horizon, there is a 25% chance the real rate of return will be less than 3.1% and a 25% chance the return will be greater than 6.7% (bold numbers on the bottom line in the table above). Therefore, we can say the return is just as likely to be within the range from 3.1% to 6.7% as not. The median real return over thirty years is expected to be 4.9%.

The DBS and CBB Programs have a slightly different asset allocation policy than the DB Program because they are not invested in real estate or private equity. The allocation to the other asset classes is about 45% US equities, 25% international equities, and 30% core fixed income. We generated a slightly lower expected real rate of return for these programs. The range at the 30-year horizon is from 2.9% at the 25th percentile to 6.5% at the 75th percentile, and the median is 4.7% (about 0.2% lower than the DB Program).

Administrative and Investment-Related Expenses: The investment return is assumed to be net of all administrative and investment-related expenses. The following table below shows the ratio of expenses to the CalSTRS Plan assets over the last five years. The expense ratio is calculated as the total expense divided by the ending asset balance at fair market value.

($million)	CalSTRS Plan Assets	Administrative		Investment		Expense Ratio
		Expense	Ratio	Expense	Ratio	
1999	$ 99,784.7	$ 45.0	0.045%	$ 45.0	0.045%	0.090%
2000	112,781.7	50.5	0.045	61.3	0.054	0.099
2001	103,137.6	54.5	0.053	85.2	0.083	0.135
2002	96,709.5	63.8	0.066	80.1	0.083	0.149
2003	100,372.3	72.7	0.072	80.7	0.080	0.153

The expenses for the Securities Lending Program are shown with other investment related expenses in the System's financial statements. Since this expense is not related to the income from the invested assets, we have excluded these costs. Based on this data, it appears the investment expenses represent about 0.15% of the CalSTRS Plan assets. The expense ratios, measured in this way, have increased recently due to the

decline in the fair value of assets. We do not expect the ratio to continue to increase more rapidly than the plan asset base.

Reasonable Range and Recommendations: Based on the ASOP No. 27 guidelines, we conclude that the reasonable range is the expected real rates of return between the 25th and 75th percentile projected out 30 years, plus the assumed inflation rate, less administrative and investment-related expenses.

| | Percentile Results | | | | | |
| | DB Program | | | DBS and CBB Programs | | |
Components of Return	25th	50th	75th	25th	50th	75th
Real Rate of Return	3.08%	4.88%	6.72%	2.85%	4.65%	6.49%
Assumed Inflation	3.25	3.25	3.25	3.25	3.25	3.25
Expenses	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Net Investment Return	6.18%	7.98%	9.82%	5.95%	7.75%	9.59%

There is a slightly less than 50% chance that the net return will be 8% or more over a 30-year period. A net return of 8% is at the 51st percentile for the DB Program and at the 54th percentile for the DBS and CBB Programs. Although not in the center of the recommended range, in our opinion an 8% return is still reasonable. We recommend the long-term net investment return assumption of 8.00% be retained for all three Programs.

| | Investment Return | |
	DB Program	DBS and CBB Programs
Current Assumption	8.00%	8.00%
Reasonable Range	6.18% - 9.82%	5.95% - 9.59%
Recommended Assumption	8.00%	8.00%

Interest on Member Accounts

Use in the Valuation: This assumption is used to predict the level of future member account balances. In the DB Program, the account balance may be refunded upon termination of membership. In the DBS and CBB Programs, all benefits are dependent on the level of the account balance.

The current assumption is 6.00% per year for the DB Program and 8.00% per year for the DBS and CBB Programs.

DB Program: The Board's policy is to credit interest to member accounts in an amount to be calculated annually based on the rate paid on two-year Treasury notes for the previous twelve months. The rate can go no higher than the actuarial assumed investment return, nor lower than a current passbook rate.

In light of this policy, the assumption has been set equal to the assumed increase in the Consumer Price Index plus a margin to reflect the yield in excess of inflation on two-year Treasuries. The following table shows the average excess yield of two-year Treasuries over inflation for the last ten years.

	CPI	2-Yr Treas.	Excess
1994	2.5%	5.9%	3.4%
1995	3.0	6.2	3.2
1996	2.8	5.8	3.0
1997	2.3	6.0	3.7
1998	1.7	5.1	3.4
1999	2.0	5.4	3.4
2000	3.7	5.7	2.0
2001	3.2	6.0	3.8
2002	1.1	3.5	2.4
2003	2.1	2.4	0.3

Prior to 1994, the excess of the yield on two-year Treasuries over inflation was significantly less than shown above. The average two-year Treasury rate over the last ten years was 5.2%, or 2.9% above inflation, but the two-year Treasury rate has come down dramatically relative to inflation for several of the last few years. Therefore, we are recommending that the assumption remain at 6.00% which is 2.75% above the recommended inflation assumption.

DBS and CBB Programs: The Board's policy is to credit interest to member accounts based on the statutory minimum rate for the year, plus a portion of the returns in excess of the statutory minimum. The Board has the authority to establish a reserve for short-term fluctuations in the actual returns from year to year so that the minimum credit can be allocated from current invested assets. Nevertheless, the long-term intention is to allocate all of the investment earnings to the member accounts. Therefore, the assumed long-term credit to member accounts should be equal to the assumed long-term expected return for the DBS and CBB Programs, or 8.00% per year.

Recommendations: Our recommended assumptions are shown in the following table.

Interest on Member Accounts		
	DB Program	**DBS and CBB Programs**
Current Assumption	6.00%	8.00%
Recommended Assumption	6.00%	8.00%

Wage Growth

Use in the Valuation: Estimates of future salaries are based on two types of assumptions. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salaries due to promotion and longevity occur even in the absence of inflation. The promotion and longevity assumptions, referred to as the merit scale, will be reviewed with the other demographic assumptions.

The current wage growth assumption is 0.75% above the inflation assumption, or 4.25%.

Historical Perspective: We have used statistics from the Social Security Administration on the National Average Wage back to 1951. For years prior to 1951, we studied the Total Private Nonagricultural Wages as published in *Historical Statistics of the U.S., Colonial Times to 1970*. The data for each year is documented in Exhibit 4.

There are numerous ways to review this data. For consistency with our observations of other indices, the table below shows the compounded annual rates of wage growth for various ten-year periods, and for longer periods ended in June of 2002. Wage data for 2003 is not yet available.

Decade	Wage Growth	CPI Incr.	Real Wages
1992-2002	3.78%	2.52%	1.26%
1982-1992	4.67	3.75	0.92
1972-1982	7.37	8.81	(1.44)
1962-1972	5.21	3.28	1.93
1952-1962	3.74	1.32	2.42

Period	Wage Growth	CPI Incr.	Real Wages
1992-2002	3.78%	2.52%	1.26%
1982-2002	4.23	3.14	1.09
1972-2002	5.26	4.99	0.27
1962-2002	5.25	4.56	0.69
1952-2002	4.95	3.90	1.05
75 Years	4.58	3.15	1.43

The excess of wage growth over price inflation represents the increase in the standard of living, also called productivity, or real wage growth.

History of National Real Wage Growth
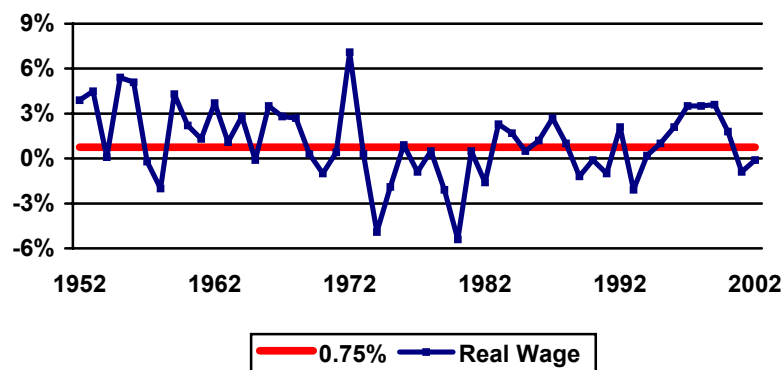
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We also looked at the average CalSTRS Earnable Salary over the last 30 years. These averages are not as reliable as the national statistics, since they include the influence of a change in the number of members from one point to another.

The Office of the Chief Actuary of the Social Security Administration has projected the wage index we used for the historical analysis into the future. In the 2003 Trustees Report, the long-term annual increase in the National Average Wage is 1.1% higher than the Social Security inflation assumption of 3.0%.

Reasonable Range and Recommendation: Based on our judgment, we believe that a range between 3.50% and 5.00% is reasonable for the assumed increase in wages. We recommend that the long-term assumed wage inflation rate remain the same at 4.25% per year. This reflects a decrease in the assumed rate of inflation from 3.50% to 3.25%, and an increase in the assumed rate of real wage growth from 0.75% to 1.00%.

Wage Growth			
Current Assumption		4.25%	
Reasonable Range			
Real Growth Rate	0.25%	-	1.75%
Assumed Rate of Inflation	3.25	-	3.25
Total Wage Growth Rate	3.50%	-	5.00%
Recommended Assumption		4.25%	

Index of Exhibits

CALIFORNIA STATE TEACHERS' RETIREMENT SYSTEM
2003 ACTUARIAL EXPERIENCE ANALYSIS

Exhibit 1   **US Consumer Price Index**

June of:	Index	Increase	June of:	Index	Increase
1928	17.1				
1929	17.1	0.0 %	**1969**	36.6	5.5%
1930	16.8	(1.8)	**1970**	38.8	6.0
1931	15.1	(10.1)	**1971**	40.6	4.6
1932	13.6	(9.9)	**1972**	41.7	2.7
1933	12.7	(6.6)	**1973**	44.2	6.0
1934	13.4	5.5	**1974**	49.0	10.9
1935	13.7	2.2	**1975**	53.6	9.4
1936	13.8	0.7	**1976**	56.8	6.0
1937	14.4	4.3	**1977**	60.7	6.9
1938	14.1	(2.1)	**1978**	65.2	7.4
1939	13.8	(2.1)	**1979**	72.3	10.9
1940	14.1	2.2	**1980**	82.7	14.4
1941	14.7	4.3	**1981**	90.6	9.6
1942	16.3	10.9	**1982**	97.0	7.1
1943	17.5	7.4	**1983**	99.5	2.6
1944	17.6	0.6	**1984**	103.7	4.2
1945	18.1	2.8	**1985**	107.6	3.8
1946	18.7	3.3	**1986**	109.5	1.8
1947	22.0	17.6	**1987**	113.5	3.7
1948	24.1	9.5	**1988**	118.0	4.0
1949	23.9	(0.8)	**1989**	124.1	5.2
1950	23.8	(0.4)	**1990**	129.9	4.7
1951	25.9	8.8	**1991**	136.0	4.7
1952	26.5	2.3	**1992**	140.2	3.1
1953	26.8	1.1	**1993**	144.4	3.0
1954	26.9	0.4	**1994**	148.0	2.5
1955	26.7	(0.7)	**1995**	152.5	3.0
1956	27.2	1.9	**1996**	156.7	2.8
1957	28.1	3.3	**1997**	160.3	2.3
1958	28.9	2.8	**1998**	163.0	1.7
1959	29.1	0.7	**1999**	166.2	2.0
1960	29.6	1.7	**2000**	172.4	3.7
1961	29.8	0.7	**2001**	178.0	3.2
1962	30.2	1.3	**2002**	179.9	1.1
1963	30.6	1.3	**2003**	183.7	2.1
1964	31.0	1.3			
1965	31.6	1.9			
1966	32.4	2.5			
1967	33.3	2.8			
1968	34.7	4.2			

Exhibit 2   **California Consumer Price Index**

June of:	Index	Increase	June of:	Index	Increase
1958	28.1				
1959	28.5	1.4%	**1984**	103.6	4.5%
1960	29.1	2.1	**1985**	108.4	4.6
1961	29.5	1.4	**1986**	112.2	3.5
1962	30.0	1.7	**1987**	116.3	3.7
1963	30.2	0.7	**1988**	121.7	4.6
1964	30.8	2.0	**1989**	128.2	5.3
1965	31.6	2.6	**1990**	134.3	4.8
1966	32.1	1.6	**1991**	140.1	4.3
1967	32.9	2.5	**1992**	145.2	3.6
1968	34.3	4.3	**1993**	148.9	2.5
1969	36.0	5.0	**1994**	150.7	1.2
1970	37.9	5.3	**1995**	154.2	2.3
1971	39.4	4.0	**1996**	156.6	1.6
1972	40.5	2.8	**1997**	160.0	2.2
1973	42.7	5.4	**1998**	163.6	2.3
1974	47.1	10.3	**1999**	167.8	2.6
1975	52.0	10.4	**2000**	174.0	3.7
1976	55.2	6.2	**2001**	183.2	5.3
1977	59.5	7.8	**2002**	185.9	1.5
1978	64.6	8.6	**2003**	189.9	2.2
1979	71.0	9.9			
1980	83.3	17.3			
1981	90.1	8.2			
1982	98.5	9.3			
1983	99.1	0.6			

Exhibit 3   **Capital Market Assumptions**

Asset Class	Expected Real Return	Standard Deviation
US Equities	6.75%	22.0%
International Equities	6.75	22.0
Core Fixed Income	3.25	8.0
Private Equity	10.00	35.0
Real Estate	5.00	13.5
Cash Equivalents	2.00	1.5

Asset Class	Cross Correlation Matrix					
	US Equities	Int'l Equities	Core Fixed	Private Equity	Real Estate	Cash
US Equities	1.00					
Int'l Equities	0.70	1.00				
Core Fixed	0.25	0.10	1.00			
Private Equity	0.65	0.60	0.10	1.00		
Real Estate	0.50	0.40	0.50	0.15	1.00	
Cash	0.10	0.00	0.40	0.10	0.30	1.00

The capital market assumptions were combined with the Board's asset allocation policy to generate expected returns over a thirty-year period. The model assumes that investment returns are lognormally distributed and is based on mathematical formulas from *The Long-Term Expected Rate of Return: Setting It Right* by Olivier de la Grandville as published in the Financial Analysts Journal, Nov/Dec 1998.

Exhibit 4   **Wage Index**

June of:	Index	Increase		June of:	Index	Increase
1927	$1,159.14					
1928	1,162.53	0.3%		1968	$5,571.76	6.9%
1929	1,196.88	3.0		1969	5,893.76	5.8
1930	1,164.95	(2.7)		1970	6,186.24	5.0
1931	1,086.09	(6.8)		1971	6,497.08	5.0
1932	954.02	(12.2)		1972	7,133.80	9.8
1933	892.58	(6.4)		1973	7,580.16	6.3
1934	929.34	4.1		1974	8,030.76	5.9
1935	968.53	4.2		1975	8,630.92	7.5
1936	1,008.20	4.1		1976	9,226.48	6.9
1937	1,071.58	6.3		1977	9,779.44	6.0
1938	1,047.39	(2.3)		1978	10,556.03	7.9
1939	1,076.41	2.8		1979	11,479.46	8.7
1940	1,106.41	2.8		1980	12,513.46	9.0
1941	1,228.81	11.1		1981	13,773.10	10.1
1942	1,455.70	18.5		1982	14,531.34	5.5
1943	1,661.79	14.2		1983	15,239.24	4.9
1944	1,796.28	8.1		1984	16,135.07	5.9
1945	1,865.46	3.9		1985	16,822.51	4.3
1946	2,009.14	7.7		1986	17,321.82	3.0
1947	2,205.08	9.8		1987	18,426.51	6.4
1948	2,370.53	7.5		1988	19,334.04	4.9
1949	2,430.52	2.5		1989	20,099.55	4.0
1950	2,570.33	5.8		1990	21,027.98	4.6
1951	2,799.16	8.9		1991	21,811.60	3.7
1952	2,973.32	6.2		1992	22,935.42	5.2
1953	3,139.44	5.6		1993	23,132.67	0.9
1954	3,155.64	0.5		1994	23,753.53	2.7
1955	3,301.44	4.6		1995	24,705.66	4.0
1956	3,532.36	7.0		1996	25,913.90	4.9
1957	3,641.72	3.1		1997	27,426.00	5.8
1958	3,673.80	0.9		1998	28,861.44	5.2
1959	3,855.80	5.0		1999	30,469.84	5.6
1960	4,007.12	3.9		2000	32,154.82	5.5
1961	4,086.76	2.0		2001	32,921.92	2.4
1962	4,291.40	5.0		2002	33,252.09	1.0
1963	4,396.64	2.5				
1964	4,576.32	4.1				
1965	4,658.72	1.8				
1966	4,938.36	6.0				
1967	5,213.44	5.6				

Section 4
Demographic Assumptions

Actuarial Standard of Practice (ASOP) No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries giving advice on selecting demographic assumptions for defined benefit plans. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

The purpose of a study of demographic experience is to compare what happened to the membership during the study period (July 1, 1999, through June 30, 2003) with what was expected to happen based on the assumptions used in the most recent Actuarial Valuation. Studies of demographic experience involve several steps.

- First, the number of members changing membership status, called decrements, during the study are tabulated by entry age, attained age, duration or sex, or a combination of these.

- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called the exposure, by the expected rates of decrement.

- Then, the number of actual decrements are compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio).

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, sex, or duration does not follow the expected pattern, new assumptions are considered. Recommended revisions normally are not an exact representation of the experience during the observation period. Judgment is required to predict future experience from past trends and current evidence, including a determination of the amount of weight to assign to the most recent experience.

Revised rates of decrement are tested by using them to recalculate the expected number of decrements during the study period, and the results are shown as revised A/E Ratios.

The remainder of this section presents the results of the demographic study. We have prepared tables that show a comparison of the actual and expected decrements and the overall ratio of actual to expected results under the current assumptions. If a change is being proposed, the revised A/E Ratios are shown as well.

Salary adjustments, other than the economic assumption for wage inflation, are treated as demographic assumptions. However, a different method of investigation is needed for salaries than is used for the decrements. These adjustments have been analyzed with historical data as described later in this section.

The following list shows the demographic assumptions we reviewed, all of which are based on the experience of the membership. We are making recommendations for changing only a few of the assumptions.

All Assumptions Based on Experience of the DB Program	
	Recommended Revisions
Mortality	
Healthy Retired Members	no
Beneficiaries	no
Active Members	no
Pre-1972 Disabled Members	yes
Disabled Members	no
Service Retirement	
Retirement from Active Membership	yes
Retirement from Vested Membership	no
Disability	
Coverage A	no
Coverage B	yes
Other Terminations of Membership	
Withdrawal	yes
Probability of Refund	yes
Merit Scale Salary Adjustments	no

Mortality

Retired Members: Mortality has been improving in this country throughout the century with dramatic improvements at pre-retirement ages. Mortality has also been improving at the retired ages and recent experience studies have shown this to be true in the DB Program. If the actual to expected ratio (A/E) is greater than 100%, we have predicted fewer deaths, and therefore have built in some margin for future mortality improvements.

This assumption applies to the retired members only. The mortality was changed in the last study to the 1994 Group Annuity Mortality Table, published by the Society of Actuaries. The 1994 GAM is a set of two sex-distinct tables. The previous change was in 1988, and we did not change the mortality in 1991 or 1995. We are not recommending a change at this time to a modification of the 1994 Group Annuity Mortality Table since the last Experience Analysis

	Mortality of Healthy Retired Members			
	Number of Deaths (1999-2003)		**Actual / Expected Ratios**	
	Actual Number	**Expected Number**	**2003 Study**	**1999 Study**
Male	6,652	6,625	100%	102%
Female	11,212	10,491	107%	105
Total	17,864	17,116	104%	104%

We noticed a slight decline in the A/E Ratios below age 80, but not significant enough to recommend a change at this time. Notice the margin for the male retirees has declined.

Current Assumption: Male 1994 GAM (-3) to age 77, then graduated to 1994 GAM at age 92

Female 1994 GAM (-2) to age 77, then graduated to 1994 GAM at age 87

Recommendation: No Changes

The mortality experience for retired members electing different survivorship options is critical for the determination of the option factors, but has little impact on the actuarial valuation. The mortality experience by option elected will be studied later in conjunction with a review of the actuarial equivalency factors.

We also recommend that the assumed mortality table used after retirement for currently active members continue to be set back an additional two years from the table used for current retirees to allow for future mortality improvements. This reflects the belief that present active members will experience even lower mortality than those now retired. This is the current assumption and does not represent a change.

Beneficiaries: This assumption applies to the surviving beneficiaries of members who have elected a joint and survivor annuity. The reported deaths are only for those beneficiaries who died while receiving an allowance, that is, after the death of the member. There is not complete data on the mortality experience of beneficiaries prior to the death of the member, because there is no requirement that the death be reported to the System. The mortality of beneficiaries prior to the death of the member is more critical to the development of the option factors than to the results of the valuation.

	Mortality of Beneficiaries			
	Number of Deaths (1999-2003)		Actual / Expected Ratios	
	Actual Number	Expected Number	2003 Study	1999 Study
Male	486	445	109%	109%
Female	1,543	1,396	111	102
Total	2,029	1,846	110%	104%

The experience shows there is still a reasonable margin. We are not recommending any changes at this time.

Current Assumption: Male 1994 GAM (-1) to age 87, then graduated to 1994 GAM at age 92

Female 1994 GAM (-2) to age 77, then graduated to 1994 GAM at age 87

Recommendation: No Changes

Active Members: The recent trend of improving mortality is especially evident with the active members' experience. The assumption was changed in 1988 and 1999. If the A/E Ratio is under 100%, that means we are overvaluing the death benefits. However, this also means we may be undervaluing the retirement benefit.

	Mortality of Active Members			
	Number of Deaths (1999-2003)		Actual / Expected Ratios	
	Actual Number	Expected Number	2003 Study	1999 Study
Male	808	1,045	77%	101%
Female	1,091	1,283	85	95
Total	1,899	2,328	82%	98%

The experience in the last four years is quite different than we were expecting, and also different than the experience in previous observation periods. Part of the difference may be due to a data collection anomaly, and part of the difference may be that the population is aging rapidly and the mortality rates at the older end of the active member spectrum are too high. We are recommending that we delay any changes until we

observe this trend holding steady. The financial impact of this assumption is very small, but we will continue to monitor the results.

Current Assumption:	Male	Two-year setback from retired mortality.
	Female	Two-year setback from retired mortality.

Recommendation:	No Changes

Pre-1972 Disabled Retirees: These mortality rates apply to the closed group of members who retired with a disability before 1972. The tables were changed in 1988 to the 1951 Group Annuity Mortality Table with age setbacks and modified slightly in 1999. The following chart shows the experience over the last four years.

	Mortality of Pre-1972 Disabled Members			
	Number of Deaths (1999-2003)		**Actual / Expected Ratios**	
	Actual Number	**Expected Number**	**2003 Study**	**1999 Study**
Male	15	12	125%	95%
Female	109	77	142	117
Total	124	89	139%	113%

With a small remaining population, this assumption has very little significance. The results will continue to be volatile as the group gets smaller and older. We are recommending that this group be combined with the other disabled members for purposes of measuring mortality.

Current Assumption:	Male	1951 GAM (-1)
	Female	1951 GAM (-7)

Recommendation:	Male	1994 GAM
	Female	1994 GAM

Impact on the Valuation:	This minor change will have a negligible impact on the valuation since there are so very few members in the group.

Termination from Disability

Members may terminate the disabled status by returning to active membership, by recovering to inactive status, or by death. The current and proposed valuation method does not call for a prediction of a return to active status. Instead, those members are assumed to remain disabled for life, and recoveries to active status are treated in the normal course of an actuarial valuation as demographic gains and losses.

The rates of termination during the first three years of disability are significantly higher than normal mortality rates. Therefore, special rates are in effect for the first three years of disability, regardless of the age of the disabilitant. The recent experience shows that the select period is still very important.

		Termination of Disabled Members – First Three Years			
		Terminations (1999-2003)		Actual / Expected Ratios	
	Year	Actual Rate	Expected Rate	2003 Study	1999 Study
Male	1	4.2%	11.4%	37%	102%
	2	2.7%	7.7%	35	73
	3	3.9%	6.2%	63	94
Number of Males		61	144	42%	92%
Female	1	3.9%	6.0%	65%	100%
	2	4.5%	3.8%	118	79
	3	3.7%	3.0%	123	83
Number of Females		193	208	93%	91%
Total Number		254	352	72%	91%

During this period, we had more members remain in disability status than we anticipated. However, the total number of members in this category is very small, and the impact is therefore small. We recommend no change at this time, but we will continue to monitor the experience.

The next table shows the opposite experience for disabled members after the third year of disability, excluding those who returned to active membership.

	Mortality of Disabled Members After Third Year				
	Number of Deaths (1999-2003)		Actual / Expected Ratios		
	Actual Number	Expected Number	2003 Study	1999 Study	Combined Studies
Male	233	198	118%	88%	104%
Female	387	310	125	97	112
Total	620	508	122%	93%	108%

Although the experience was dramatically different than the prior study, when we combined the results over the eight-year observation period, the A/E Ratios were reasonable. We made some changes in 1999 that partially reflected the 1995-99 experience.

We believe there is not enough evidence to justify another change at this time.

Current Assumption: Male   1994 GAM (minimum of 2.5%)

          Female   1994 GAM (minimum of 2.2%)

          First three years use special rates as shown

Recommendation: No Changes

Service Retirement

We expected the analysis of retirement rates to show a change in experience during this observation period because of the influences of the prior benefit changes. Indeed we found the pattern of retirements during the period has changed dramatically, especially for those members with over 30 years of service.

Retirements from Active Membership Status: The following table shows the actual number of retirements and the expected number based on the retirement assumptions in the last valuation. Due to the benefit changes, we looked separately at members who retired with and without 30 years of service.

		Retirement from Active Membership Status			
		Number Retired (1999-2003)		Actual / Expected Ratios	
	Years	Actual Number	Expected Number	2003 Study	1999 Study
Male	Under 30	3,236	6,900	47%	
	30 & Up	8,420	4,290	196%	
Number of Males		11,656	11,190	104%	96%
Female	Under 30	10,733	14,711	73%	
	30 & Up	10,832	4,510	240%	
Number of Females		21,565	19,221	112%	93%
Total	Under 30	13,969	21,611	65%	
	30 & Up	19,252	8,800	219%	
Total Number		33,221	30,411	109%	94%
		Revised Assumptions			
Male	Under 30	3,236	3,310	98%	
	30 & Up	8,420	7,084	119%	
Number of Males		11,656	10,394	112%	96%
Female	Under 30	10,733	11,252	95%	
	30 & Up	10,832	9,395	115	
Number of Females		21,565	20,647	104%	93%
Total	Under 30	13,969	14,562	96%	
	30 & Up	19,252	16,479	117	
Total Number		33,221	31,041	107%	94%

Although the experience shows there were about 9% more retirements in the observation period than expected, when the data is broken between those with and without 30 years of service at retirement, it is clear the assumed retired rates need to be revised.

In our judgment, there may have been a number of members with more than 30 years who retired immediately as soon as the legislative changes were enacted. Since we don't expect another one-time influence, our proposed assumptions produce a revised A/E Ratio that is still over 100%. In other word, we do not recommend using the 1999-2003 experience as the total basis for future predictions, but rather a slightly toned down version of the recent experience.

The following table shows the expected and recommended probabilities of retirement.

Age	Male Retirement Rates				Female Retirement Rates			
	Current Rates	Revised Rates			Current Rates	Revised Rates		
		Blend	Under 30	30 & Up		Blend	Under 30	30 & Up
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
50	0.0%	1.5%	0.0%	1.5%	0.0%	1.5%	0.0%	1.5%
51	0.0	1.5	0.0	1.5	0.0	1.5	0.0	1.5
52	0.0	1.5	0.0	1.5	0.0	1.5	0.0	1.5
53	0.0	2.0	0.0	2.0	0.0	1.5	0.0	1.5
54	1.5	2.0	0.0	2.0	1.5	2.0	0.0	2.0
55	5.0	3.8	3.0	6.0	6.0	5.6	5.0	8.0
56	3.5	3.3	2.0	6.0	4.0	4.5	3.5	8.0
57	4.0	4.3	2.0	8.0	4.0	5.2	3.5	10.0
58	6.0	6.9	3.0	12.0	6.0	7.4	4.5	15.0
59	15.0	10.2	5.0	16.0	9.0	9.5	6.0	18.0
60	20.0	15.8	7.0	25.0	12.0	15.9	10.0	30.0
61	14.0	22.6	7.0	40.0	13.0	17.0	10.0	35.0
62	14.0	19.1	9.0	35.0	17.0	16.6	12.0	32.0
63	25.0	18.0	13.0	27.0	25.0	20.6	18.0	30.0
64	25.0.	17.3	12.0	27.0	25.0	17.6	15.0	27.0
65	20.0	18.3	14.0	27.0	19.0	18.4	16.0	27.0
66	16.0	15.5	10.0	27.0	16.0	17.6	15.0	27.0
67	16.0	15.2	10.0	27.0	16.0	17.5	15.0	27.0
68	16.0	15.1	10.0	27.0	16.0	17.6	15.0	27.0
69	16.0	15.0	10.0	27.0	16.0	17.8	15.0	27.0
70	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

We will only be using the recommended retirement rates shown in the "Under 30" and "30 & Up" columns in the table above. The "blended" rates are a combination of the recommendations without regard to the 30-year threshold, and are designed to provide a comparison with the current retirement rates.

Current Assumption:	Male	As shown in Column (A) above
	Female	As shown in Column (E) above
Recommendation:	Male	As shown in Columns (C) and (D) above
	Female	As shown in Columns (G) and (H) above

Impact on the Valuation: The recommended service retirement rates will increase the funding requirements of the DB Program.

1990 Benefit Structure: A valuation must be made to determine if the cost of the 1990 benefit structure falls within certain parameters. For this purpose, we recommend leaving the retirement rates as they were in 1990.

Retirement from Vested Terminated Membership Status: We currently assume that all vested terminated members retire at age 60. The average age of retirement for the observation period was 59. We recommend no change in this assumption.

Disablement

Due to the enactment of new disability provisions in 1992, we have been using higher rates of disablement for Coverage B members since the 1993 Actuarial Valuation. A summary of our current findings and recommended changes is shown in the following chart.

	Disablement of Active Members			
	Number of Disabilities (1999-2003)		Actual / Expected Ratios	
	Actual Number	Expected Number	2003 Study	1999 Study
Coverage A				
Male	233	268	87%	97%
Female	685	624	110	106
Total	918	892	103%	103%
Coverage B				
Male	234	322	73%	91%
Female	792	950	83	90
Total	1,026	1,272	81%	90%
	Revised Assumptions			
Coverage B				
Male	234	274	85%	91%
Female	792	819	97	90
Total	1,026	1,093	94%	90%

We lowered the rates of disability for Coverage A members as a result of the 1995 study, and the number of Coverage A disabilities in this study continues to be close to the number assumed. Therefore, we are not recommending any changes in the rates of disability for Coverage A members.

There were fewer Coverage B disabilities in this observation period than we assumed. We expected higher disability rates for Coverage B because of the greater benefits and the added incentive for members to apply for a disability. We lowered the disability rates as a result of the 1999 study and it is clear that another adjustment is warranted. The initial anti-selection during the 1992 election process may have disappeared. That is, some members who perceived they were in less than average health, or were contemplating filing for disability, would have been more apt to elect Coverage B thus lowering the overall health of Coverage B members when compared to the Coverage A members.

Because the Coverage B disability benefit is not directly proportional to service, we expected, and have seen, higher rates of disability for members who entered the System at later ages. We have three sets of Coverage B disability rates; one for those who

enter prior to age 40 (originally assumed to be the same rates as for Coverage A members), one for those who enter the System between the ages of 40 and 44, and one for those who enter the System at or after age 45. We are recommending reductions to the rates for those who enter the System at all ages.

Even though the disability rates for Coverage B will be reduced by about 15%, this change may increase costs slightly. There are several possible reasons for an expected cost increase. One reason is that the service retirement benefit, particularly for members with 30 years of service, may be more valuable than the Coverage B disability benefit for some members. More importantly, the cost is related to the value of the benefit, not just the benefit levels, and the mortality assumption for service retirements is predicting a much longer life expectancy than the mortality assumption for disabled members.

Current Assumption:	Coverage A	Special rates by age only
	Coverage B	Special rates by entry age group
Recommendation:	Coverage A	No change
	Coverage B	Reduce rates of disability by approximately 15%, on average.
Impact on the Valuation:	The recommended disability rates may increase the funding requirements of the DB Program.	

Withdrawal

All Terminations: Actual and expected numbers of terminated members under the current and recommended assumption are shown in the following table. These figures represent all members who terminated active membership, whether or not they elected a refund.

| | | Termination from Active Membership Status | | | |
| | | Number of Members Terminated (1999-2003) | | Actual / Expected Ratios | |
	Years	Actual Number	Expected Number	2003 Study	1999 Study
Male	Under 30	7,454	8,561	87%	93%
	30-34	2,674	3,036	88%	94%
	35-39	1,999	2,216	90%	95%
	40-44	1,603	1,819	88%	96%
	45 & Up	2,794	3,028	92%	103%
Subtotal Males		16,524	18,660	89%	95%
Female	Under 30	20,845	21,925	95%	90%
	30-34	4,799	4,800	100%	95%
	35-39	3,324	3,589	93%	90%
	40-44	2,974	3,201	93%	96%
	45 & Up	3,852	3,883	99%	100%
Subtotal Females		35,794	37,398	96%	92%
Total Number		52,318	56,058	93%	93%
		Revised Assumptions			
Male	Under 30	7,454	7,498	99%	93%
	30-34	2,674	2,664	100	94
	35-39	1,999	1,941	103	95
	40-44	1,603	1,535	104	96
	45 & Up	2,794	2,755	101	103
Subtotal Males		16,524	16,393	101%	95%
Female	Under 30	20,845	20,548	101%	90%
	30-34	4,799	4,593	104	95
	35-39	3,324	3,469	96	90
	40-44	2,974	3,145	95	96
	45 & Up	3,852	3,554	108	100
Subtotal Females		35,794	35,309	101%	92%
Total Number		52,318	51,702	101%	94%

The rates of termination have been reduced in each of the last two studies, but further reductions are warranted at this time based on the results of this study. The overall experience indicated that termination rates were about 5% - 10% lower than expected during the observation period. In particular, actual rates of termination for members with

less than 10 years of service were lower than expected. For members with 10 or more years of service, we are not recommending any changes.

In prior studies, we adjusted the termination rates part way toward the 100% A/E Ratio. In the 1999 study, we stated that if the experience stays at the current levels, further reductions may be needed in the future. In this study, we are recommending adjustments that reflect all of the terminations in the 1999-2003 observation period.

Duration	Annual Rate of Termination (by Entry Age and Duration)							
	Current Assumed Rates				Recommended Rates			
	27	32	37	42	27	32	37	42
Male								
1	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
2	9.5	9.2	9.2	9.5	7.7	7.7	7.7	7.7
3	6.8	6.8	6.8	7.2	5.4	5.4	5.4	5.4
4	5.8	5.8	5.8	6.2	4.4	4.4	4.4	4.4
5	4.2	4.2	4.2	4.2	3.0	3.0	3.0	3.0
10	2.0	2.0	2.0	2.4	2.0%	2.0%	2.0%	2.4%
15	1.1	1.1	1.2		1.1%	1.1%	1.2%	
20	0.6	0.6			0.6%	0.6%		
25	0.5				0.5%			
Female								
1	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
2	8.3	8.3	7.5	6.8	7.2	7.2	7.2	7.2
3	7.3	6.5	5.5	5.3	6.3	5.8	5.3	4.9
4	7.1	5.6	4.5	4.0	5.8	5.4	4.9	3.9
5	5.8	4.2	3.5	3.0	5.8	4.2	2.9	2.5
10	2.0	1.7	1.4	1.6	2.0%	1.7%	1.4%	1.6%
15	0.9	1.0	0.9		0.9%	1.0%	0.9%	
20	0.7	0.9			0.7%	0.9%		
25	0.6				0.6%			

Current Assumption: Rates as illustrated in the left half of the table above

Recommendation: Rates as illustrated in the right half of the table above

Impact on the Valuation: The recommended reduction in termination rates during the first ten years of membership will increase the funding requirements of the DB Program.

Probability of Refund: The following table illustrates, for sample ages and durations, the proportion of terminating members who elect to withdraw all funds and forfeit future benefits. Based on the data from this study period, more members elected a refund at termination than we expected. This was primarily due to higher-than-expected refunds for vested members with less than 10 years of service.

We recommend that this assumption be revised to closely follow the experience during the observation period, as follows:

	Probability of Terminating Member Electing a Refund (by Entry Age)							
	Current Assumed Rates				Recommended Rates			
	27	32	37	42	27	32	37	42
Male								
Under 5	100%	100%	100%	100%	100%	100%	100%	100%
10	40	40	45	40	50	43	45	45
15	40	35	35		42	37	30	
20	40	30			36	27		
25	30				27			
Female								
Under 5	100%	100%	100%	100%	100%	100%	100%	100%
10	25	30	30	25	35	36	36	35
15	20	30	20		30	30	30	
20	20	20			20	20		
25	20				10			

Current Assumption: Rates as illustrated in the left half of the table above

Recommendation: Rates as illustrated in the right half of the table above

Impact on the Valuation: The recommended increase in the rate of refunds will decrease the funding requirements of the DB Program.

Merit Salary Increases

Annual increases in salaries, exclusive of the observed ultimate wage growth during the period, are shown at several entry ages and durations.

	Annual Increase in Salaries Due to Merit (by Entry Age)							
	Current Increases				Actual Experience			
Yr.	27	32	37	42	27	32	37	42
1	5.3%	5.1%	4.9%	4.9%	4.0%	3.6%	3.5%	3.3%
5	4.8	4.5	3.8	3.8	4.3	3.9	3.7	3.5
10	3.0	2.7	2.3	2.2	2.7	2.7	2.4	2.2
15	1.5	1.4	1.1	1.1	1.5	1.3	1.2	0.8
20	1.2	1.1	0.8	0.8	1.3	1.2	1.1	0.8
25	1.0	0.9	0.6		1.1	0.8	1.1	
30	0.7	0.6			0.8	1.0		
35	0.7				1.1			

The current merit wage scale was changed in 1999 and adjustments do not appear to be necessary at this time.

Current Assumption: Rates as illustrated in the left half of the table above

Recommendation: No changes